DEFENSE INFORMATION SYSTEMS AGENCY
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IN REPLY REFER TO: Joint Interoperability Test Command (JTE) 3 May 2012

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the General DataComm, Inc., Xedge 6000, Fixed Network Element (F-NE), with Software Release 7.3.14

References: (a) Department of Defense Directive 4630.05, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) Department of Defense Instruction 8100.04, "DoD Unified Capabilities (UC)," 9 December 2010
(c) through (e), see Enclosure 1

1. References (a) and (b) establish the Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification.

2. The General DataComm, Inc., Xedge 6000, F-NE, with Software Release 7.3.14, is hereinafter referred to as the System Under Test (SUT). The Xedge 6000 solution is a family of products with models submitted for testing that includes Xedge 6280 and 6645 platforms. The SUT meets all its critical interoperability requirements and JITC certifies the SUT for joint use in the Defense Information Systems Network (DISN) as a F-NE. The operational status of the SUT will be verified during deployment. Any new discrepancies that are discovered in the operational environment will be evaluated for impact and adjudicated to the satisfaction of the Defense Information Systems Agency (DISA) via a vendor Plan of Action and Milestones to address the concern(s) within 120 days of identification. JITC conducted testing using F-NE requirements within the Unified Capabilities Requirements (UCR) 2008, Change 2, Reference (c), and other sponsor requested requirements. JITC tested the SUT using F-NE test procedures, Reference (d) and test procedures developed to address the sponsor unique requirements. JITC does not certify any other configurations, features, or functions, except those cited within this memorandum. This certification expires upon changes that affect interoperability, but no later than three years from the date of this memorandum.

3. This finding is based on interoperability testing conducted by JITC, and Information Assurance (IA) Certification Authority (CA) approval of the IA configuration. JITC conducted Interoperability testing at the Indian Head, Maryland test facility from 28 November 2011 through 10 January 2012. The DISA IA CA has reviewed the JITC published IA Assessment Report for the SUT, Reference (e), and has provided a positive recommendation of the IA configuration on 27 March 2012. The acquiring agency or site will be responsible for the Department of Defense Information Assurance Certification and Accreditation Process (DIACAP) accreditation. Enclosure 2 documents the test results and describes the tested

network and system configurations. Enclosure 3, System Functional and Capability Requirements, lists the F-NE Capability Requirements (CR) and Functional Requirements (FR).

4. Section 5.9 of the UCR establishes the interfaces and threshold CRs/FRs used to evaluate the interoperability of the SUT as a F-NE. Tables 1 and 2 list the F-NE interfaces, CRs, FRs, and the component status of the SUT.

Table 1. SUT Interface Interoperability Status

Interface		Critical (See note 1.)	UCR Ref (UCR 2008, Change 2)	Threshold CR/FR (See note 2.)	Status	Remarks
NE	Analog	No	5.9.2.3.1	1, 2, and 4	NA	Not supported by the SUT.
	Serial	No	5.9.2.3.2	1, 2, and 4	Certified	SUT met requirements for specified interfaces.
	BRI ISDN	No	5.9.2.3.3	1, 2, and 4	NA	Not supported by the SUT.
	DS1	No	5.9.2.3.4	1, 2, 3, and 4	Certified	SUT met requirements for specified interfaces.
	E1	No	5.9.2.3.5	1, 2, 3, and 4	Certified	SUT met requirements for specified interfaces.
	DS3	No	5.9.2.3.6	1, 2, 3, and 4	Certified	SUT met requirements for specified interfaces.
	OC-X	No	5.9.2.3.8	1, 2, 3, and 4	Certified	SUT met requirements for the following interfaces: OC-3 ATM and OC-12 ATM
	IP (Ethernet) 10/100/1000 and GbE	No	5.9.2.3.9	1, 2, 4, and 7	Certified	SUT met requirements for specified interfaces.
NM	10Base-X	Yes	5.3.2.4.4	8	Certified	SUT met NM requirements for specified interfaces.
	100Base-X	Yes	5.3.2.4.4	8	Certified	

NOTES:
1. UCR does not specify any minimum interfaces. The SUT must minimally provide one of the listed ingress and egress interfaces specified.
2. CR/FR requirements are contained in Table 2. CR/FR numbers represent a roll-up of UCR requirements.

LEGEND:

100Base-X	100 Mbps Ethernet generic designation	IP	Internet Protocol
10Base-X	10 Mbps Ethernet generic designation	ISDN	Integrated Services Digital Network
ATM	Asynchronous Transfer Mode	Mbps	Megabits per second
BRI	Basic Rate Interface	NA	Not Applicable
CR	Capability Requirement	NE	Network Element
DS1	Digital Signal Level 1 (1.544 Mbps)	NM	Network Management
DS3	Digital Signal Level 3 (44.736 Mbps)	OC-X	Optical Carrier - X (OC-3, OC-12, etc.,)
E1	European Interface Standard (2.048 Mbps)	Ref	Reference
FR	Functional Requirement	SUT	System Under Test
GbE	Gigabit Ethernet	UCR	Unified Capabilities Requirements

Table 2. SUT CRs and FRs Status

CR/ FR ID	Capability/Function	Applicability (See note)	UCR Ref (UCR 2008, Change 2)	Status	Remarks
F-NE CR/FR					
1	**General NE Requirements**				
	General Requirements	Required	5.9.2.1	Met	
	Alarms	Required	5.9.2.1.1	Met	
	Congestion Control & Latency	Required	5.9.2.1.2	Met	
2	**Compression**				
	G.726	Conditional	5.9.2.2	NA	Not supported by the SUT.
	G.728	Conditional	5.9.2.2	NA	Not supported by the SUT.
	G.729	Conditional	5.9.2.2	NA	Not supported by the SUT.
3	**Interface Requirements**				
	Timing	Required	5.9.2.3.7	Met	
4	**Device Management**				
	Management Options	Required	5.9.2.4.1	Met	
	Fault Management	Conditional	5.9.2.4.2	Met	
	Loop-Back Capability	Conditional	5.9.2.4.3	Met	
	Operational Configuration Restoral	Required	5.9.2.4.4	Met	
5	**DLoS**				
	DLoS Transport	Conditional	5.9.2.4.5	NA	Not supported by the SUT.
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	SUT is a Layer-2 device and transports IPv4 and IPv6 traffic transparently.
7	**NM Requirements**				
	VVoIP NMS Interface Requirements	Required	5.3.2.4.4	Met	
	General Management Requirements	Required	5.3.2.17.2	Met	

NOTE: Applicability refers to the high-level roll-up of section requirements. A detailed listing of individual requirements applicability is provided in Enclosure 3.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation		
CR	Capability Requirement	IPv4	Internet Protocol version 4
CS-ACELP	Conjugate Structure Algebraic Code-Excited Linear Prediction	IPv6	Internet Protocol version 6
		Kbps	Kilobits per second
DLoS	Direct Line of Sight	LD-CELP	Low Delay-Code Excited Linear Prediction
F-NE	Fixed Network Element	NA	Not Applicable
FR	Functional Requirement	NM	Network Management
G.726	ITU-T speech codec for ADPCM (32 Kbps)	NMS	Network Management System
G.728	ITU-T speech codec for LD-CELP (16 Kbps)	Ref	Reference
G.729	ITU-T speech codec for CS-ACELP (8 Kbps)	SUT	System Under Test
ID	Identification	UCR	Unified Capabilities Requirements
ITU-T	International Telecommunication Union – Telecommunication	VVoIP	Voice and Video over Internet Protocol

5. In accordance with the Program Manager's request, JITC did not develop a detailed test report. JITC distributes interoperability information via the JITC Electronic Report Distribution system, which uses Non-secure Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program, which .mil/.gov users can access on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool at http://jitc.fhu.disa.mil (NIPRNet). Information related to DISN testing is on the Telecommunications Switched Services Interoperability website at

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http://jitc.fhu.disa.mil/tssi. All associated data is available on the DISA Unified Capabilities Certification Office (UCCO) website located at https://aplits.disa.mil.

6. JITC testing point of contact is Ms. Fanny Lee-Linnick, commercial (301) 743-4259. Her e-mail address is Fanny.Lee-Linnick@disa.mil, mailing address: 3341 Strauss Avenue, Suite 236, Indian Head, Maryland 20640-5149. The UCCO Tracking Number is 1027301.

FOR THE COMMANDER:

GRANSTROM.DANIEL.J.1160392475

for
RICHARD A. MEADOR
Chief
Battlespace Communications Portfolio

3 Enclosures a/s

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ADDITIONAL REFERENCES

(c) Office of the Assistant Secretary of Defense Document, "Department of Defense Unified Capabilities Requirements 2008, Change 2," December 2010
(d) Joint Interoperability Test Command Document, "Unified Capabilities Interoperability Test Plan," 4 February 2010
(e) Joint Interoperability Test Command Document, "Information Assurance Findings Summary for General DataComm, Xedge 6000, Version 7.3.14 (Tracking Number: 1027301), 17 February 2012

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CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. General DataComm, Inc., Xedge 6000, Fixed Network Element (F-NE), with Software Release 7.3.14

2. SPONSOR. Mr. Kenneth Kingston; e-mail: Kenneth.kingston@us.army.mil; USAISEC-TSD.

3. SYSTEM POC. Ron Plante, General DataComm, Inc, 6 Rubber Avenue, Naugatuck, CT 06770, e-mail: ron.plante@gdc.com

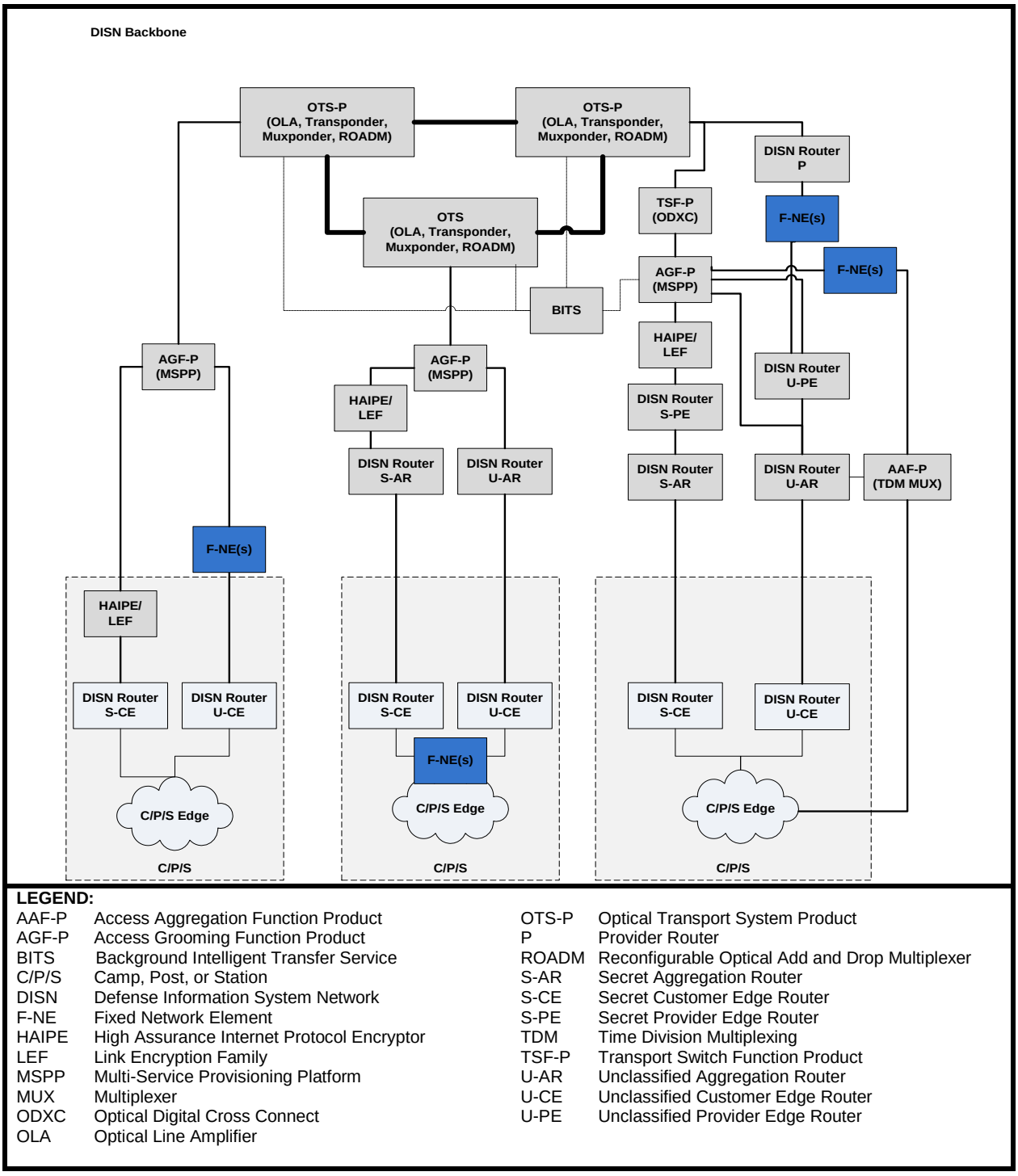
4. TESTER. Joint Interoperability Test Command (JITC), Indian Head, Maryland.

5. SYSTEM DESCRIPTION. The General DataComm, Inc., Xedge 6000, F-NE solution is a family of products that consists of two platforms: Xedge 6645 and 6280, with Software Release 7.3.14, hereinafter referred to as the System Under Test (SUT). The SUT's primary function is to adapt legacy communications circuits for transport over a new backbone network. The SUT also allows a network user to transport Ethernet traffic over a shared access facility to the backbone. Access to the backbone is via a Fast Ethernet or Gigabit Ethernet link.

The Xedge 6645 is a 16-slot chassis that employs main and standby slot-0 controllers, main and standby switch fabric, and backup power supplies. The Xedge 6280 is a 7-slot chassis that employs main and standby slot-0 controllers, main and standby switch fabric, and backup power supplies. It also accommodates a Network Timing Modules (NTM) for advanced system timing configurations. The Xedge 6280 is available in Alternating Current (AC) and Direct Current power source versions. The AC version's auto ranging power supplies automatically adapt to AC power inputs ranging from 90 to 264VAC. The Xedge 6280 front panel can accept one or two slot-0 modules (main/standby), one or two switch fabric modules (main/standby), and up to six additional slot controller modules (slots 1 through 6).

Both chassis models also accommodate one Fan Tray Assembly and one or two NTM for advanced system timing configurations.

6. OPERATIONAL ARCHITECTURE. The JITC tested the SUT under the F-NE Unified Capabilities Requirements (UCR) product category. A high-level Defense Information Systems Network (DISN) node architecture, as depicted in Figure 2-1, displays the F-NE device. The SUT as an F-NE solution can be deployed to extend DISN services and legacy data, video, and voice services in native format over Ethernet, Internet Protocol (IP), Multiprotocol Label Switching, and legacy Asynchronous Transfer Mode (ATM) networks in the Wide Area Network (WAN) and on a camp, post, or station within the Local Area Network (LAN) infrastructure. The SUT as an F-NE solution meets the UCR requirements and can be used to augment WAN or LAN infrastructures.



LEGEND:

AAF-P	Access Aggregation Function Product
AGF-P	Access Grooming Function Product
BITS	Background Intelligent Transfer Service
C/P/S	Camp, Post, or Station
DISN	Defense Information System Network
F-NE	Fixed Network Element
HAIPE	High Assurance Internet Protocol Encryptor
LEF	Link Encryption Family
MSPP	Multi-Service Provisioning Platform
MUX	Multiplexer
ODXC	Optical Digital Cross Connect
OLA	Optical Line Amplifier
OTS-P	Optical Transport System Product
P	Provider Router
ROADM	Reconfigurable Optical Add and Drop Multiplexer
S-AR	Secret Aggregation Router
S-CE	Secret Customer Edge Router
S-PE	Secret Provider Edge Router
TDM	Time Division Multiplexing
TSF-P	Transport Switch Function Product
U-AR	Unclassified Aggregation Router
U-CE	Unclassified Customer Edge Router
U-PE	Unclassified Provider Edge Router

Figure 2-1. DISN Architecture

7. INTEROPERABILITY REQUIREMENTS. The interface and Capability Requirements (CR), Functional Requirements (FR), Information Assurance (IA), and other requirements for F-NE products are established by the Department of Defense UCR 2008, Change 2, Sections 5.4 and 5.9.

7.1 Interfaces. The F-NE products use its interfaces to connect to LAN or DISN WAN infrastructure. The threshold requirements for interfaces specific to the F-NE products are listed in Table 2-1.

Table 2-1. F-NE Interface Requirements

Interface	Critical (See note 1.)	UCR Ref (UCR 2008, Change 2)	Threshold CR/FR (See note 2.)	Criteria	Remarks
Ingress (LAN side)					
Analog	No	5.9.2.3.1	1, 2, and 4	Meet minimum CR/FRs and interface standards.	Provides access to local infrastructure.
Serial	No	5.9.2.3.2	1, 2, and 4		
BRI ISDN	No	5.9.2.3.3	1, 2, and 4		
DS1	No	5.9.2.3.4	1, 2, 3, and 4		
E1	No	5.9.2.3.5	1, 2, 3, and 4		
DS3	No	5.9.2.3.6	1, 2, 3, and 4		
OC-X	No	5.9.2.3.8	1, 2, 3, and 4		
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7		
Egress (WAN side)					
Serial	No	5.9.2.3.2	1, 2, 3, and 4	Meet minimum CR/FRs and interface standards.	Provides access to local infrastructure.
DS1	No	5.9.2.3.4	1, 2, 3, and 4		
E1	No	5.9.2.3.6	1, 2, 3, and 4		
DS3	No	5.9.2.3.6	1, 2, 3, and 4		
OC-X	No	5.9.2.3.8	1, 2, 3, and 4		
IP (Ethernet)	No	5.9.2.3.9	1, 2, 4, and 7		
DLoS	No	5.9.2.3.9	1, 2, 3, 4, and 5		
NM					
10Base-X	Yes	5.3.2.4.4	8	Meet minimum CR/FRs and interface standards.	Provides access to local infrastructure.
100Base-X	Yes	5.3.2.4.4	8		

NOTES:
1. UCR does not specify any minimum interfaces.
2. CR/FR requirements are contained in Table 2-2. CR/FR numbers represent a roll-up of UCR requirements.

LEGEND:

100Base-X	100 Mbps Ethernet generic designation	IP	Internet Protocol
10Base-X	10 Mbps Ethernet generic designation	ISDN	Integrated Services Digital Network
BRI	Basic Rate Interface	LAN	Local Area Network
CR	Capability Requirement	Mbps	Megabits per second
DLoS	Direct Line of Sight	NM	Network Management
DS1	Digital Signal Level 1 (1.544 Mbps)	OC-X	Optical Carrier - X (OC-3, OC-12, etc.,)
DS3	Digital Signal Level 3 (44.736 Mbps)	Ref	Reference
E1	European Interface Standard (2.048 Mbps)	UCR	Unified Capabilities Requirements
F-NE	Fixed Network Element	WAN	Wide Area Network
FR	Functional Requirement		

7.2 CRs and FRs. The F-NE products have required and conditional features and capabilities that are established by UCR 2008, Change 2, Section 5.9. The SUT does not need to provide non-critical (conditional) features and capabilities. If they are present, however, they must function according to the specified requirements.

Table 2-2 lists the features and capabilities and their associated requirements for the SUT products. Table 3-1 of Enclosure 3 provides detailed CR/FR requirements.

Table 2-2. SUT CRs and FRs

CR/FR ID	Capability/Function	Applicability (See note)	UCR Ref (UCR 2008, Change 2)	Criteria	Remarks
1	**General NE Requirements**				
	General Requirements	Required	5.9.2.1	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	
	Alarms	Required	5.9.2.1.1		
	Congestion Control & Latency	Required	5.9.2.1.2		
2	**Compression**				
	G.726	Conditional	5.9.2.2	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	
	G.728	Conditional	5.9.2.2		
	G.729	Conditional	5.9.2.2		
3	**Interface Requirements**				
	Timing	Required	5.9.2.3.7	Meet UCR requirements.	Applicable to TDM interfaces
4	**Device Management**				
	Management Options	Required	5.9.2.4.1	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	
	Fault Management	Conditional	5.9.2.4.2		
	Loop-Back Capability	Conditional	5.9.2.4.3		
	Operational Configuration Restoral	Required	5.9.2.4.4		
5	**DLoS**				
	DLoS Transport	Conditional	5.9.2.4.5	Meet UCR DLoS requirements.	
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Meet UCR IPv6 requirements.	
7	**NM Requirements**				
	VVoIP NMS Interface Requirements	Required	5.3.2.4.4	Meet applicable UCR requirements. Detailed requirements and associated criteria are provided in Table 3-1 of Enclosure 3.	
	General Management Requirements	Required	5.3.2.17.2		

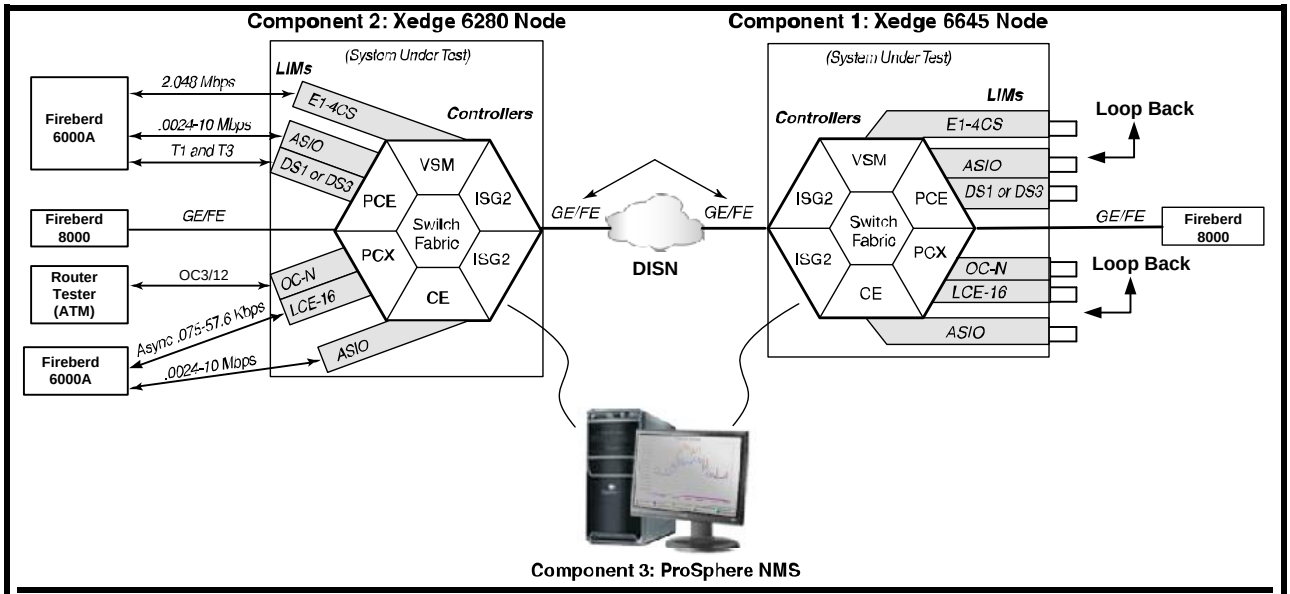
NOTE: Annotation of 'required' refers to high-level requirement category. Applicability of each sub-requirement is provided in enclosure 3.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation
CR	Capabilities Requirement
CH	Change
CS-ACELP	Conjugate Structure Algebraic Code-Excited Linear Prediction
DLoS	Direct Line of Sight
FR	Functional Requirement
G.726	ITU-T speech codec for ADPCM (32 Kbps)
G.728	ITU-T speech codec for LD-CELP (16 Kbps)
G.729	ITU-T speech codec for CS-ACELP (8 Kbps)
ID	Identification
IPv6	Internet Protocol version 6
ITU-T	International Telecommunication Union – Telecommunication
Kbps	Kilobits per second
LD-CELP	Low Delay Code Excited Linear Prediction
NE	Network Element
NM	Network Management
NMS	Network Management System
Ref	Reference
SUT	System Under Test
TDM	Time Division Multiplexing
UCR	Unified Capabilities Requirements
VVoIP	Voice and Video over Internet Protocol

7.3 Other. None.

8. TEST NETWORK DESCRIPTION. JITC tested the SUT at its Indian Head, Maryland Advanced Technologies Test bed. Figure 2-2 shows the SUT's Test Configuration.



LEGEND:

ATM	Asynchronous Transfer Mode	LIM	Line Interface Modules
ASIO	Adaptive Serial Input Output	Mbps	Megabits per second
ASYNC	Asynchronous	NMS	Network Management System
CE	Customer Edge	OC-3	Optical Carrier-3
DISN	Defense Information Systems Network	OC-12	Optical Carrier-12
DS1	Digital Signal, Level 1	OC-N	Optical Carrier Level N (n=number)
DS3	Digital Signal, Level 3	PCE	Packet Circuit Emulator
E1	European Carrier 1	PCX	Packet Cell Switch
FE	Fast Ethernet	T1	T-carrier 1
GE	Gigabit Ethernet	T3	T-carrier 3
ISG2	IP Service Gateway 2	VSM	Voice Service Module
Kbps	Kilobits per second		
LCE-16	Legacy Circuit Emulator-16		

Figure 2-2. SUT's Test Configuration

9. SYSTEM CONFIGURATION. Table 2-3 lists the Tested SUT equipment shown in Figure 2-2, Table 2-4 lists the Non-SUT equipment used to test the SUT and Table 2-5 lists the test equipment used to generate voice, Synchronous Optical Network, and IP traffic.

Table 2-3. Hardware/Software Tested SUT Equipment

	Qty	Part Number	Type and Position
Xedge 6645 032M159-001 Component1	2	200P001-002	Controller Slot 0 Main and Stand-by
	1	200M011-001	Controller Slot 1&2
	1	200M009-001	Controller Slot 3&4
	2	032P002-004	Fabric Main and Stand-by
	1	032M016-003	Controller Slot 5
	1	032M036-011	Controller Slot 6
	1	032P187-001	LIM Slot 1
	1	032P153-003	LIM Slot 2
	1	200P003-001	LIM Slot 2
	2	032P098-011	LIM Slot 3&6
	1	032P046-001	LIM Slot 3
	1	032P108-001	LIM Slot 3
	1	032P194-001	LIM Slot 3
	2	032P098-001	LIM Slot 3&5
	1	032P062-001	Network Timing Module Main
Xedge 6280 032M128-001 Component2	2	200P001-002	Controller Slot 0 Main and Stand-by
	1	200M011-001	Controller Slot 1&2
	1	200M009-001	Controller Slot 3&4
	2	032P002-004	Fabric Main and Stand-by
	1	032M016-003	Controller Slot 5
	1	032M036-011	Controller Slot 6
	1	032P187-001	LIM Slot 1
	1	032P153-003	LIM Slot 2
	1	200P003-001	LIM Slot 2
	2	032P098-011	LIM Slot 3&6
	1	032P046-001	LIM Slot 3
	1	032P108-001	LIM Slot 3
	1	032P194-001	LIM Slot 3
	2	032P098-001	LIM Slot 3&5
	1	032P062-001	Network Timing Module Main
ProSphere NMS Component3	1	200U301-C01	ProSphere 6.0 (Patch AJ)
	1	STIG PC	Windows 7 PC

LEGEND:

LIM	Line Interface Module	PC	Personal Computer
NMS	Network Management System	STIG	Security Technical Implementation Guideline

Table 2-4 Non-SUT Equipment

Component	Software Version	Function
Cisco 15454	09.00-008I-17.17	ETH 100T-12-G, OC-3IR-STM-1 SH-1310-8, OC-12IR-STM-4-1310-4, DS-1N-14, G1K-4, OC-192SR/STM-64, OC-48 AS-IR-1310, DS-3N-12E
Sycamore ODXC	7.6.21 Build 0562.26.27.57.14	GPIC2 2 x OC-192/STM-64, GPIC 24 x OC-3-12/STM-1-4IR, GPIC2 8 x OC-48/STM-16, USC - OC-192 LR 2c LIM 1
Juniper T320 Router	9.2.R2.15	4 x FE 100 Base Tx, 10 x GbE LAN 1000 Base TX, 1x OC-192 SM SR2, 1 x 10GbE LAN, XENPAK
RedCom Switch	6.1	4 Port line card (MA0653-115) 2/ MET Interface Board (MA0683-122 3/ S3P Board/ line signaling Protocol for trunk lines (GR303 or SS7)(MA0688-101)

LEGEND:

100 Base TX	Fast Ethernet	MET	Multiple E1/T1
DS	Digital Signal	OC	Optical Carrier
E	Ethernet	ODXC	Optical Digital Cross Connect
E1	European Basic Multiplex Rate	R	Revision
ETH	Ethernet	S3P	Single Slot System Processor
FE	Fast Ethernet	SH	Switch Hook
G	Gigabit	SM	Single Mode
GbE	Gigabit Ethernet	SR	Short Reach
GPIC	Gigabit Port Interface Controller	SS7	Signaling System 7
GR	Gateway Router	STM	Synchronous Transport Module
IR	Intermediate Reach	SUT	System Under Test
LAN	Local Area Network	T1	T-carrier 1
LIM	Line Interface Module	Tx	Transmit
LR	Long Reach	USC	Universal Services Card

Table 2-5. Test Equipment

Manufacturer	Type	Port Type	Software Version
Agilent	Optical Tester	1550 nm	A.06.01
		1310 nm	
	Router Tester 900	OC-3/OC-12 /POS	6.11
		OC-48 Multilayer	
		1000 Base X	
Agilent	Rack Mounted Router Tester 900	10 Gb LAN/WAN	6.11
		10/100/1000 Base-T	
		1000 Base-X	
		OC-48c POS	
		OC-3/12/POS	
Agilent JDSU	T-Berd 8000	OC-192 POS	6.11
		DSU	6.4
		10/100/1000	
		OC-3-12	
		DS-3	
		OC-192	

LEGEND:

10/100/1000 Base-X	10/100/1000 Mbps Ethernet generic designation	LAN	Local Area Network
		Mbps	Megabits per second
DS	Digital Signal	nm	nanometer
DSU	Data Services Unit	OC	Optical Carrier
Gb	Gigabyte	POS	Packet Over Synchronous Optical Network
JDSU	Vendor Name	WAN	Wide Area Network

10. TEST LIMITATIONS. None

11. INTEROPERABILITY EVALUATION RESULTS. The SUT meets the critical interoperability requirements for F-NE and JITC certifies its joint use within the DISN. Additional discussion regarding specific testing results is contained in subsequent paragraphs.

11.1 Interfaces. The SUT's interface status is provided in Table 2-6.

Table 2-6. SUT F-NE Interface Requirements Status

	Interface	Critical (See note)	UCR Ref (UCR 2008, Change 2)	Status	Remarks
NE	Analog	No	5.9.2.3.1	NA	Not supported by the SUT.
	Serial	No	5.9.2.3.2	Certified	SUT met requirements for specified interfaces.
	BRI ISDN	No	5.9.2.3.3	NA	Not supported by the SUT.
	DS1	No	5.9.2.3.4	Certified	SUT met requirements for specified interfaces.
	E1	No	5.9.2.3.5	Certified	SUT met requirements for specified interfaces.
	DS3	No	5.9.2.3.6	Certified	SUT met requirements for specified interfaces.
	OC-X	No	5.9.2.3.8	Certified	SUT met requirements for the following specified interfaces: OC-3 ATM and OC-12 ATM
	IP (Ethernet) 10/100/1000 and GbE	No	5.9.2.3.9	Certified	SUT met requirements for specified interfaces.
NM	10Base-X	Yes	5.3.2.4.4	Certified	SUT met NM requirements for specified interfaces.
	100Base-X	Yes	5.3.2.4.4	Certified	

NOTE: UCR does not specify any minimum interfaces.

LEGEND:

100Base-X	100 Mbps Ethernet generic designation	ISDN	Integrated Services Digital Network
10Base-X	10 Mbps Ethernet generic designation	Mbps	Megabits per second
ATM	Asynchronous Transfer Mode	NA	Not Applicable
BRI	Basic Rate Interface	NE	Network Element
DS1	Digital Signal Level 1 (1.544 Mbps)	NM	Network Management
DS3	Digital Signal Level 3 (44.736 Mbps)	OC-X	Optical Carrier - X (OC-3, OC-12, etc.,)
E1	European Interface Standard (2.048 Mbps)	Ref	Reference
F-NE	Fixed Network Element	SUT	System Under Test
GbE	Gigabit Ethernet	UCR	Unified Capabilities Requirements
IP	Internet Protocol		

11.2 CRs and FRs. Table 2-7 lists the SUT's CR/FR statuses. Table 3-1 of the System Functional and Capability Requirements (Enclosure 3) provides the detailed CR/FR requirements.

Table 2-7. SUT CRs and FRs Status

CR/FR ID	Capability/ Function	Applicability (See note)	UCR Ref (UCR 2008, Change 2)	Status	Remarks
F-NE CR/FR					
1	**General NE Requirements**				
	General Requirements	Required	5.9.2.1	Met	
	Alarms	Required	5.9.2.1.1	Met	
	Congestion Control & Latency	Required	5.9.2.1.2	Met	
2	**Compression**				
	G.726	Conditional	5.9.2.2	NA	Not supported by the SUT
	G.728	Conditional	5.9.2.2	NA	Not supported by the SUT
	G.729	Conditional	5.9.2.2	NA	Not supported by the SUT
3	**Interface Requirements**				
	Timing	Required	5.9.2.3.7	Met	
4	**Device Management**				
	Management Options	Required	5.9.2.4.1	Met	
	Fault Management	Conditional	5.9.2.4.2	Met	
	Loop-Back Capability	Conditional	5.9.2.4.3	Met	
	Operational Configuration Restoral	Required	5.9.2.4.4	Met	
5	**DLoS**				
	DLoS Transport	Conditional	5.9.2.4.5	NA	Not supported by the SUT
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	SUT is a Layer-2 device and transports IPv4 and IPv6 traffic transparently
7	**NM Requirements**				
	VVoIP NMS Interface Requirements	Required	5.3.2.4.4	Met	
	General Management Requirements	Required	5.3.2.17.2	Met	

NOTE: Annotation of 'required' refers to high-level requirement category. Applicability of each sub-requirement is provided in Enclosure 3.

LEGEND:

ADPCM	Adaptive Differential Pulse Code Modulation	ITU-T	International Telecommunication Union – Telecommunication
CR	Capabilities Requirement	Kbps	Kilobits per second
CS-ACELP	Conjugate Structure Algebraic Code-Excited Linear Prediction	LD-CELP	Low Delay-Code Excited Linear Prediction
DLoS	Direct Line of Sight	NA	Not Applicable
F-NE	Fixed-Network Element	NE	Network Element
FR	Functional Requirement	NM	Network Management
G.726	ITU-T speech codec for ADPCM (32 Kbps)	NMS	Network Management System
G.728	ITU-T speech codec for LD-CELP (16 Kbps)	Ref	Reference
G.729	ITU-T speech codec for CS-ACELP (8 Kbps)	SUT	System Under Test
ID	Identification	UCR	Unified Capabilities Requirements
IPv6	Internet Protocol version 6	VVoIP	Voice and Video over Internet Protocol

a. General NE Requirements

(1) General Requirements. In accordance with (IAW) UCR 2008, Change 2, Section 5.9.2.1 all NEs shall meet the following general requirements and conditions:

(a) The introduction of an NE(s) shall not cause the End-to-End (E2E) average Mean Opinion Score (MOS) to fall below 4.0 as measured over any 5-minute time interval. The SUT met the MOS requirement as measured using test equipment and simulated voice information exchanges.

(b) The introduction of an NE(s) shall not degrade the E2E measured Bit Error Rate (BER) to no more than .03 percent from the baseline minimum E2E digital BER requirement, which is not more than one error in $1x10^9$ bits (averaged over a 9-hour period). The SUT met the requirement as measured using test equipment and simulated information exchanges.

(c) The introduction of an NE(s) shall not degrade secure transmission for secure end devices as defined by UCR 2008, Change 2, Section 5.2.12.6, and DoD Secure Communications Devices. JITC tested secure information exchanges by using DoD Secure Communications Devices such as Secure Telephone Unit/Secure Terminal Equipment devices with no noted issues.

(d) The NE(s) shall support a minimum modem transmission speed of 9.6 kilobits per second (kbps) across the associated NE(s). JITC tested this information exchange by using a modem and simulated information exchange with no noted issues.

(e) The NE(s) shall support a minimum facsimile transmission speed of 9.6 kbps across the associated NE(s). JITC tested this information exchange by using a facsimile and simulated information exchanges with no noted issues.

(f) The NE shall transport all call control signals transparently on an E2E basis. JITC tested this information exchange by using an actual call control signals via a Private Branch Exchange Transmission Link Level 1 calls and simulated information exchanges with no noted issues.

(2) Alarms. The NE shall provide the capability of detecting a Carrier Group Alarm (CGA). NEs that support IP ingress/egress traffic either as inbound or outbound NE traffic and/or as transport between NE shall support one or more of the following routing protocols: Link-State and/or Distance-Vector. Than the NE can notify the IP network (e.g., LAN, Metropolitan Area Network) the condition of its link state for transporting ingress IP traffic, namely operational or down. The SUT is a Layer-2 device and it passes all the routing protocols, IP link states transparently between connecting end equipments, and it propagates all CGA with no noted issues. In addition, it provides loss of signal alarm in case of loss of connectivity events for connecting end equipments.

(3) Congestion Control and Latency. IAW UCR 2008, Change 2, the NE shall ensure that congestion and latency between paired NEs does not affect DISN calls in progress or subsequent calls. Call congestion and latency requirements are as follows:

(a) Time Division Multiplexer/Multiplexing (TDM) Transport. The SUT is a Layer-2 device and SUT provides transparent TDM Transport. Therefore, the following TDM transport requirements are not applicable to the SUT. These requirements are the responsibility of connecting end equipments.

1. A dynamic load control signal (e.g., contact closure) shall be provided to the DSN switch.

2. Congestion is not possible in the NE by nature of its functioning (e.g., a TDM multiplexer or transcoder).

3. A software capability in limiting the provisioning the ingress and egress interfaces making congestion impossible even under the worst congestion scenario. This can be done by limiting the bearer or aggregate provisioning.

4. TDM Transport Latency. The addition of NEs with TDM transports shall not increase the one-way latency per NE pair when measured from end to end over any 5-minute period specified as follows:

a. TDM ingress G.711 (non-secure calls) to non-transcoding G.711 TDM egress shall not increase delay more than 10 millisecond (ms) per NE pair as measured E2E.

b. TDM ingress G.711 (non-secure calls) to transcoding TDM egress with compression codecs shall not increase delay by more than 100 ms per NE pair as measured E2E.

c. TDM ingress G.711 (secure calls) to non-transcoding TDM egress G.711 shall not increase delay by more than 50 ms per NE pair as measured E2E.

d. TDM ingress G.711 (secure calls) to transcoding TDM egress with compression codecs shall not increase delay by more than 250 ms per NE pair as measured E2E.

(b) IP Transport. The NE(s) using IP transport shall implement IP congestion control. Congestion may be controlled by using Differentiated Services, which shall be capable of providing preferential treatment for call congestion over other media types and a capability to limit the provisioning of input, and output interfaces so congestion is impossible under the worst transport congestion scenario. The IP interface parameters subject to ingress/egress requirements shall be met. The SUT is a Layer-2 device and it passes all IP traffic transparently, therefore, none of the above IP transport requirement is applicable to the SUT, instead those are responsibility of connecting end equipments.

(c) Direct Line of Sight (DLoS) Transport. The SUT does not provide DLoS Transport.

b. Compression. The SUT does not support Compression.

c. Interface Requirements. Timing. The NE shall be able to derive timing signal from an internal source, an incoming digital signal, or an external source. This requirement applies to TDM interfaces only; IP interfaces do not need to meet this requirement.

d. Device Management. The SUT shall provide the following device management functions:

(1) Management Options. The NE devices are to be managed by at least one of the following:

(a) A front or back panel and/or external console control capability shall be provided for local management and SUT supports only external console control capability. The SUT provides an external console capability.

(b) Remote monitoring and management by the Advanced DISN Integrated Management Support System (ADIMSS). JITC did not verify management of the SUT by ADIMSS.

(2) Fault Management. The SUT may (conditional) report any failure of self-test diagnostic function on non-active and active channels on a noninterference basis to the assigned Network Management System (NMS). JITC verified this conditional capability via Network Management (NM) testing.

(3) Loop-Back Capability. This requirement applies to TDM interfaces only; the SUT does provide loop-back capabilities via its all interfaces.

(4) Operational Configuration Restoral. Loss of power should not remove configuration settings. The SUT shall restore to the last customer-configured state before the power loss, without intervention when power is restored. JITC verified this capability via NM testing.

e. DLoS. DLoS Transport. The SUT does not provide DLoS Transport.

f. Internet Protocol version 6 (IPv6) Requirements. Product Requirements. The SUT must meet UCR 2008, Change 2, Section 5.3.5.4 IPv6 requirements for Network Appliance/Simple Server. The SUT is a Layer-2 device and transports IPv4 and IPv6 traffic transparently so requirements specific relating to Layer-3 do not apply.

g. NM Requirements. JITC verified the following NM requirements by connecting the NMS to the SUT via all required interfaces and in addition verified via

utilization of NMS for performing test configurations, for performing alarms monitoring, and for performing fault management.

(1) Voice and Video over Internet Protocol (VVoIP) NMS Interface Requirements. The physical interface between the Defense Information Systems Agency VVoIP Element Management System (EMS) and the network components (i.e., Local Session Controller, Multifunction Soft Switch, Edge Boundary Controller, Customer Edge Router) is a 10/100Megabit per second Ethernet interface. The interface will work in either of the two following modes using auto-negotiation: Institute of Electrical and Electronics Engineers (IEEE), Ethernet Standard 802.3, 1993; or IEEE, Fast Ethernet Standard 802.3u, 1995.

(2) General Management Requirements. The SUT must support Simple Network Management Protocol Version 3 format. A network appliance shall have Operations interfaces that provide a standard means by which management systems can directly or indirectly communicate with and, thus, manage the various network appliances in the DISN. The physical interface between the Local EMS and the VVoIP network components shall be an Ethernet connection IAW UCR 2008, Change 2, paragraph 5.3.2.4.4, VoIP NMS Interface Requirements. The physical interface between the VVoIP EMS and the VVoIP network components shall also be an Ethernet connection IAW UCR 2008, Change 2, paragraph 5.3.2.4.4. There shall be a local craftsperson interface (Craft Input Device for Operations Administration & Management) for all VVoIP network components.

11.3 Other. None.

12. TEST AND ANALYSIS REPORT. In accordance with the Program Manager's request, JITC did not prepare a detailed test report. JITC distributes interoperability information via the JITC Electronic Report Distribution system, which uses Non-secure Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program, which .mil/gov users can access on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool at http://jit.fhu.disa.mil (NIPRNet). Information related to DSN testing is on the Telecommunications Switched Services Interoperability website at http://jitc.fhu.disa.mil/tssi.

SYSTEM FUNCTIONAL AND CAPABILITY REQUIREMENTS

The Network Elements (NE) and Fixed Network Elements (F-NE) have required and conditional features and capabilities that are established by the Unified Capabilities Requirements (UCR). The System Under Test (SUT) does not need to meet conditional requirements. If they are provided, they must function according to the specified requirements. The detailed Functional requirements and Capability Requirements for NEs are listed in Table 3-1.

Table 3-1. NE Capability/Functional Requirements Table

ID	Requirement	UCR Ref (UCR 2008 CH 2)	F-NE
1	The introduction of an NE(s) shall not cause the E2E average MOS to fall below 4.0 as measured over any 5-minute time interval.	5.9.2.1 (1)	R
2	The introduction of an NE(s) shall not degrade the E2E measured BER to no more than .03 percent from the baseline minimum E2E digital BER requirement which is not more than one error in 1x109 bits (averaged over a 9-hour period).	5.9.2.1 (2)	R
3	The introduction of an NE(s) shall not degrade secure transmission for secure end devices as defined by UCR 2008, Section 5.2.2, DoD Secure Communications Devices.	5.9.2.1 (3)	R
4	The NE(s) shall support a minimum modem transmission speed of 9.6 kbps across the associated NE(s).	5.9.2.1 (4)	R
5	The NE(s) shall support a minimum facsimile transmission speed of 9.6 kbps across the associated NE(s).	5.9.2.1 (5)	R
6	The NE shall transport all call control signals transparently on an E2E basis.	5.9.2.1 (6)	R
7	[Conditional] The NEs that support a P2N capability shall meet the following additional requirements when deployed in a P2N architectural configuration:	5.9.2.1 (7)	C
7A	The aggregate egress from all NEs in the P2NP architecture must be identical to the aggregate ingress of all NEs in the same P2N architecture. However, if all or part of the P2N is operating in a P2MP mode that is applying multicast from a centrally designated NE to one or more of the associated peripheral NEs, the aggregate of the additional multicast traffic must be accounted for in the egress sum total.	5.9.2.1 (7A)	R
7B	Excluding latency, the P2N AP shall be measured as though it is a P2P architecture at the P2N AP NE endpoints ingress and egress points. As such, the P2N AP must meet all the other stated requirements of a P2P.	5.9.2.1 (7B)	R
7C	For a given P2N AP, the maximum latency allowed E2E, as measured over any 5-minute period at the P2N AP NE ingress and egress points, shall be 5 ms or less, when added in addition to the expected P2P latency. Hence, as an example, if the expected P2P latency requirement for a P2N AP is 50 ms, then P2N AP maximum latency, regardless of the number of NE hops between the ingress and egress NEs, the measured value shall not exceed 55 ms.	5.9.2.1 (7C)	R
8	The NE shall be able to propagate Carrier Group Alarms (CGAs) upon physical loss of the TDM interface. The NE shall provide the capability of detecting a carrier group alarm (CGA). When this alarm is detected, all associated outgoing trunks shall be made busy automatically to subsequent customer call attempts. Call attempts on associated incoming trunks shall not be processed. When possible, the Reverse Make Busy feature shall be exercised on incoming trunks. Voice switching systems using a TDM connection to an NE shall receive the proper CGAs from the NE upon loss of the transport link between NEs, regardless of whether the transport link is TDM, IP, or DLoS between the NEs. The NEs that support IP ingress or egress traffic either as inbound or outbound NE traffic and/or transport between NE(s) shall support one or more of the following routing protocols: Link-State and/or Distance-Vector, so the NE can notify the IP network (e.g., LAN, MAN), using one of these routing protocols, the condition of its link state for transporting ingress IP traffic, namely operational or down.	5.9.2.1.1	R

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH 2)	F-NE
9	The NE shall assure that congestion between paired NEs does not affect DSN calls in progress or subsequent calls. Call congestion handling shall be met in one or more of the following ways.	5.9.2.1.2	R
9A	The NE shall implement TDM congestion control via one of the following methods: A. A dynamic load control signal (e.g., contact closure) shall be provided to the DSN switch per the following requirements: (1) The NE shall provide the capability to handle Carrier Group Alarm (CGA) indications from the carrier systems/equipment using the E-telemetry interface (scan points) for the TDM interfaces provided (e.g., DS0, DS1, and/or OC-X), and, comply to the Telcordia Technologies GR-303-CORE, System Generic Requirements, Objectives, and Interface, December 2000, Issue 4 and Telcordia Technologies TR-NWT-000057 that specifies the use of an COT generated DC contact closure alarm to indicate an "all-accessible-channels busy" condition.	5.9.2.1.2.1 (1A1)	C
9B	(2) The NE when interfaced to the network that provides an E-telemetry interface type (scan points) for alarm management shall be capable of CGA management that is used to minimize the effects of carrier failures on switching systems and on service. CGA scan point (binary condition, i.e., "closed" contact for active and "opened" for inactive states) when "closed" should busy out the failed circuits, release customers from the failed circuits, and prevent the failed circuits from seizing the DSN trunk equipment and prevent the NE from seizing the failed circuits.	5.9.2.1.2.1 (1A2)	C
9C	(3) The DSN CGA System Operation can be divided into three parts, i.e., detection of the carrier failure, conditioning the failed trunk, and reaction of the switching equipment to the processing of the failure. Requirements for scan point CGA are: (a) Sense Point Interface: The switching system shall provide sense points to which external CGAs can be interfaced to, so that failure of the carrier equipment shall cause the trunks to be removed from service. (b) Call Processing Actions: Receipt of a CGA shall cause call processing to be aborted on associated trunks that are not in the talking state. (c) Trunk Conditioning: Receipt of a CGA shall cause the following actions on the affected trunks: (i) Idle trunks shall be removed from the idle list. Subsequent calls for service must be ignored for the duration of the CGA. Busy-back shall be returned on those incoming trunks, which are optioned for busy-back while in the out-of-service state and proper MLPP treatment shall be applied. (ii) Trunks in the talking state shall be monitored for disconnect, after which they are to be placed in the same state as described above for idle trunks.	5.9.2.1.2.1 (1A3)	C
9D	(4) Restoration of Service: All trunks affected shall be returned to their previous state after the CGA is removed. B. Congestion is not possible in the NE by nature of its functioning (e.g., a TDM multiplexer or transcoder). C. A software capability in limiting the provisioning of the ingress and egress interfaces making congestion impossible even under the worst congestion scenario. This can be done by limiting the bearer or aggregate provisioning.	5.9.2.1.2.1 (1A4, 1B, 1C)	C
10	2. The addition of NEs with TDM transports shall not increase the one-way latency per NE pair when measured from end to end over any 5-minute period specified as follows: a. Time Division Multiplexing ingress G.711 (non-secure calls) to non-transcoding G.711 TDM egress shall not increase delay more than 10 ms per NE pair as measured end-to-end. b. Time Division Multiplexing ingress G.711 (non-secure calls) to transcoding TDM egress with compression codecs (Section 5.9.2.2, Compression) shall not increase delay by more than 100 ms per NE pair as measured end-to-end. c. Time Division Multiplexing ingress G.711 (secure calls) to non-transcoding TDM egress G.711 shall not increase delay by more than 50 ms per NE pair as measured end-to-end. d. Time Division Multiplexing ingress G.711 (secure calls) to transcoding TDM egress with compression codecs (Section 5.9.2.2, Compression) shall not increase delay by more than 250 ms per NE pair as measured end-to-end.	5.9.2.1.2.1 (2A, 2B, 2C, 2D)	C

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH 2)	F-NE
11	The NE(s) using IP transport shall implement IP congestion control. Congestion may be controlled by using DiffServ, which shall be capable of providing preferential treatment for call congestion over other media types IAW Section 5.3.3, Network Infrastructure End-to-End Performance Requirements, and a capability to limit the provisioning of input and output interfaces so congestion is impossible under the worst transport congestion scenario. The IP interface parameters subject to ingress or egress requirements shall be met IAW Section 5.9.2.3.9, IP Interface.	5.9.2.1.2.2	C
12	The NE shall implement DLoS congestion control based on the DSN traffic and signaling type to be transported. (Please see Following)	5.9.2.1.2.3	C
13	The NE transporting only TDM bearer and signaling traffic shall implement DLoS congestion control via one or more of the following methods: a. A dynamic load control signal (e.g., contact closure). b. Congestion is not possible in the NE so the maximum ingress throughput into the NE is configured so it does not exceed the DLoS link maximum egress transport capability to include all DLoS overhead control traffic between the transport devices. c. A software capability in limiting the provisioning of the ingress and egress interfaces making congestion impossible even under the worst congestion scenario. This can be done by limiting the bearer or aggregate provisioning.	5.9.2.1.2.3 (1A, 1B, 1C)	C
14	The NE transporting only ingress IP traffic, and using a DLoS transport, excluding 802.11, and/or 802.16 series standards, -shall implement DLoS IP congestion control per Section 5.9.2.1.2.2, For IP Transport. Additionally, IP congestion control may include a standards-based or proprietary protocol between the NEs that will adjust the QoS of the NE based on DLoS transport monitoring feedback to the NE to accommodate for changing environmental link conditions.	5.9.2.1.2.3 (2)	C
15	The NE transporting both TDM and IP ingress traffic simultaneously over the same DLoS transport link shall meet the following requirements: a. [Required] The NE shall provide congestion control so it provides the same level of capability, respectively, for the appropriate traffic type, TDM and IP, per the requirements for single traffic type ingress or egress to the NE. Additionally, the congestion control may include a standards-based or proprietary protocol between the NEs that will adjust the QoS of the NE based on DLoS transport monitoring feedback to the NE to accommodate for changing environmental link conditions. b. [Conditional] The use of DLoS transport shall not increase the one-way latency or packet delay per the requirements for TDM ingress and TDM or IP egress interfaces per the appropriate Section 5.9.2.1.2.1, For TDM Transport, and Section 5.9.2.3.9, IP Interface, respectively.	5.9.2.1.2.3 (3A, 3B)	C
16	The NE used for voice compression shall support at least one of the following standards: • ITU-T Recommendation G.726 • ITU-T Recommendation G.728 • ITU-T Recommendation G.729	5.9.2.2	C
17	If provided, the NE shall provide for a 2-wire and/or 4-wire analog trunk circuit(s) interface that interfaces using industry standard signaling and facility arrangements per one or more of the following:	5.9.2.3.1	C
18A	1. E&M Trunk Circuits: The NE shall interface with exchange carriers using industry standard E&M signaling. The switching system shall interface with Type I and Type II E&M signaling in accordance with paragraph 9 and subparagraphs of GR-506-CORE. The switching system shall interface with Type V E&M signaling as defined in Paragraphs 6.8.5, 6.8.6, 6.8.7.2, 6.8.8.2, and 6.8.8.3 of Telcordia Technologies Document SR-2275. The DSN switch analog trunk interface shall always originate on the M-lead.	5.9.2.3.1 (1)	C
18B	2. Single Frequency Trunk Circuits: The NE will interface with external switching facility (SF) equipment using a 4-wire E&M trunk circuit, either Type I or II. The DSN in-band signaling equipment utilizing SF will place a 2600 Hz tone on the circuit to indicate the idle state (on-hook) and the tone will be removed from the circuit to indicate the busy state (off-hook). Signaling states will be conveyed via E and M leads (Type I or II) to the telephone equipment terminating the circuit on the equipment side of the interface. The SF trunk interface consists of only the voice path conductors (T, R, T1, R1), but at a point between this transmission facility interface and the switching function the SF signal will be translated back to the two-state dc signals.	5.9.2.3.1 (2)	C

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH 2)	F-NE
18C	3. Dual Frequency Trunk Circuits: The Dual Frequency Signaling Unit (DFSU) equipment used in the DSN operates in much the same way as an SF unit, except that whenever the 2600 Hz tone is removed from the circuit a 2800 Hz tone is applied for a short period (175 ms maximum). The 2800 Hz tone burst will serve as a confirmation tone; the receiving signaling unit will only transition from on-hook to off-hook if the loss of the 2600 Hz tone is followed by the 2800 Hz tone. This prevents false on-hook to off-hook transitions from occurring due to a break in the communications circuit. Like the SF trunk interface, the DF trunk interface will consist of only the voice path conductors (T, R, T1, R1). The NE shall interface an external DFSU using a 4-wire E&M trunk circuit with Type I or II E&M signaling. This connection is on the equipment-side of a DF trunk interface.	5.9.2.3.1 (3)	C
19	The NE used for serial interface connections shall be in accordance with one of the following standards: • ITU-T Recommendation V.35 • TIA-232-F • EIA-449-1 • TIA-530-A	5.9.2.3.2	C
20	The ISDN BRI interface shall meet the requirements and conditions IAW Section 5.3.2.31.2, National ISDN 1/2 Basic Access.	5.9.2.3.3	C
21	If provided, the NE shall meet the following DS1 (T1) interface requirements and conditions of a PCM-24 Digital Trunk Interface. PCM-24 Digital Trunk Interface: An NE shall provide a PCM-24 channel digital interface with a 1.544 Mbps T1 bit stream configured in either the D3/D4 (Superframe) framing format or the D5 Extended Superframe (ESF) framing format. D5 is also referred to as Extended Frame (EF). The same framing format shall be used in both directions of transmission. Voice signals shall be encoded in the 8-bit μ (255 quantized values) pulse code modulation (PCM) encoding law. Supervisory and dial pulse (DP) signals shall utilize the A and B bits of the D3/D4 format or the A, B, C, and D bits of the D5 format for pre-CCS7 configurations. Voice channel address in-band signaling shall be provided on individual channels. The D5 format shall be the preferred and system "goal" digital framing format and shall be provided in accordance with MIL-STD-187-700. 1. Interface Characteristics: The NE shall use the DS1 24 channel standard interface as specified in ANSI T1.102, "Digital Hierarchy – Electrical Interfaces." Table 5.9.2.3.4-1, PCM-24 Electrical Interface Characteristics, provides the electrical characteristics at the interface. Table 5.9.2.3.4-2 and Table 5.9.2.3.4-3 provide a listing of the framing characteristics. (Please see UCR 2008, Change 2-Pages 1898 thru 1900)	5.9.2.3.4	C
22A	2. Supervisory Channel Associated Signaling: On-hook and off-hook status of each channel is transmitted and derived from the coding of the "A" and "B" signaling bits. Trunk seizure, answer supervision, dial pulse digits (DPs), preemption signals, and all other trunk supervisory information shall be sent and received on a per-channel basis using this scheme. Per-trunk signaling in the DSN switching system shall control the value of the "A" and "B" bits to indicate an on-hook ("A" = 0, "B" = 0) or an off-hook ("A" = 1, "B" = 1) condition. When receiving supervisory status on digital trunks using the PCM-24 format, the DSN switching system shall interpret the combination of the "A" bit = 0 andthe "B" bit = 0 as on-hook, and the combination bit = 1 and "B" bit = 1 as an off-hook indication. When signaling on Voice Frequency (VF) channels using the PCM-24 format, the least significant bit of each channel, every six frames, shall carry signaling information. Utilizing the four-state signaling option of the Superframe (D3) format, frame 6 shall contain the "A" channel signaling information and frame 12 shall contain the "B" channel signaling information. The switching system shall also interpret the combination of "A" bit = 1, "B" bit = 0, with bit position 2 in all 24 channels in the Superframe (D3) format equal to "0" as a channel alarm indication and shall also interpret the combination of "A" bit = 1, "B" bit = 0 as a remote make busy. In the ESF format ANSI defines a sixteen-state signaling option that labels the signaling bits "A" (frame 6), "B" (frame 12), "C" (frame 18), and "D" (frame 24). Because DSN does not require the "C" and "D" signaling channels the four-state option shall be used to allow changes in "A" and "B" signaling states to be transmitted twice as often. Utilizing Frames 6 and 18 in the 24-frame Extended Superframe shall contain the "A" channel signaling information; frames 12 and 24 shall contain the "B" channel signaling information.	5.9.2.3.4 (2)	C

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH 2)	F-NE
22B	3. Clear Channel Capability: The NE shall be capable of transmitting and receiving B8ZS line coding in accordance with MIL-STD-187-700.	5.9.2.3.4 (3)	C
22C	4. Alarm and Restoral Requirements: The NE shall provide the alarm and restoral features on the digital interface unit (DIU) as defined in Table 5.9.2.3.4-4, PCM-24 Alarm and Restoral Requirements. (Please see UCR 2008, Change 2-Page 1901)	5.9.2.3.4 (4)	C
23	If provided, the NE shall meet the following E1 interface requirements and conditions of a PCM-30 Digital Trunk Interface: PCM-30 Digital Trunk Interface: The NE shall provide PCM-30 digital interfaces at a data rate of 2.048 Mbps. The PCM-30 interfaces shall meet the requirements of ITU-T Recommendation G.703 and ITU-T Recommendation G.732. Voice signals in the PCM-30 framing format shall utilize the A-law encoding technique in accordance with ITU-T Recommendation G.772 (REV), "Protected Monitoring Points on Digital Transmission Systems." The pertinent requirements for the PCM-30 interface are summarized in Table 5.9.2.3.5-1, PCM-30 Electrical Interface Characteristics. (Please see UCR 2008, Change 2-Page 1902)	5.9.2.3.5	C
23A	1. Supervisory Channel Associated Signaling: When receiving supervisory status on digital trunks using the PCM-30 format, the DSN switching system shall interpret the combination of the "A" signaling channel bit = 1 and the "B" signaling channel bit = 1 as on-hook, and shall interpret the combination of the "A" signaling channel bit = 0 and the "B" signaling channel bit = 1 as an off-hook indication. The DSN switching system shall also interpret the combination of "A" bit = 1 and "B" bit = 0 as a channel alarm indication and a remote make busy. Bits "C" and "D" are not used in the DSN for signaling or control and therefore shall be set to the values "C" = 0 and "D" =1 in accordance with ITU-T Recommendation G.704.	5.9.2.3.5 (1)	C
23B	2. Alarm and Restoral Requirements: The NE shall provide the alarm and restoral features on the DIU in order to be compatible with PCM-30 facilities and terminal equipment, as shown in Table 5.9.2.3.5-3, PCM-30 Alarm and Restoral Requirements. (Please see UCR 2008, Change 2-Page 1903)	5.9.2.3.5 (2)	C
24	The DS3 interface shall meet the following requirements and conditions. Frame structure shall include M13 framing in accordance with ANSI T1.107-2002.	5.9.2.3.6.1 (1)	R
25	Frame structure may include C-bit parity application in accordance with ANSI T1.107-2002.	5.9.2.3.6.1 (2)	C
26	The line coding shall be bipolar 3 zero substitution (B3ZS) in accordance with ANSI T1.102-1993.	5.9.1.5.3.6.2	R
27	The NE shall be able to derive a timing signal from an internal source, an incoming digital signal, or an external source IAW Section 5.3.2.12.14.1.1, Timing Modes (5.3.2.12.14.1.1 Timing Modes): [Required: Media Gateway (MG)] The MGs shall meet the external timing mode requirements specified in the Telcordia Technologies GR-518-CORE, Paragraph 18.1. Most SMEOs and PBX1s will only support line timing 5.3.2.12.14.1.1.1 External Timing Mode - [Required: MG] The MGs shall support external timing modes as defined in Telcordia Technologies TR-NWT-001244. 5.3.2.12.14.1.1.2 Line Timing Mode - [Required: MG] The MGs shall support line timing modes as defined in Telcordia Technologies TR-NW-001244. 5.3.2.12.14.1.1.2 Internal Clock Requirements 5.3.2.12.14.1.1.2.1 General - [Required: MG] The MGs shall provide internal clock requirements as described in the Telcordia Technologies GR-518-CORE, Paragraph 18.2. 5.3.2.12.14.1.1.2.2 Stratum 4 Clock - [Required: MG] The MGs shall provide a stratum 4 or better internal clock. 5.3.2.12.14.1.2 Synchronization Performance Monitoring Criteria - [Required: MG] The MGs shall meet the synchronization performance monitoring criteria as described in Telcordia Technologies GR-518-CORE, Paragraph 18.3	5.9.2.3.7	R
28	The OC-X interface shall be IAW Section 5.5.3.2, Optical Transport System Interface, and/or appropriate SONET commercial standards. (NOTE: X stands for the capacity (e.g., 3, 48, 192 and higher)	5.9.2.3.8	C
29	The NE having an IP interface and using DLoS transport comprised of 802.11 and/or 802.16 series standards shall instead meet the requirements for a WAB contained in Section 5.3.1.7.2, Wireless. All other IP configurations shall meet the following:	5.9.2.3.9	C

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH 2)	F-NE
29A	a. Delay. The addition of NEs with IP transports shall not increase the one-way latency per NE pair when measured from end to end over any 5-minute period specified as follows: (1) Time Division Multiplexing ingress G.711 (non-secure calls) to non-transcoding G.711 IP egress shall not increase delay more than 50 ms per NE pair as measured end-to-end. (2) Time Division Multiplexing ingress G.711 (non-secure calls) to transcoding IP egress with compression codecs (Section 5.9.2.2, Compression) shall not increase delay by more than 100 ms per NE pair as measured end-to-end. (3) Time Division Multiplexing ingress G.711 (secure calls) to non-transcoding G.711 IP egress shall not increase delay by more than 50 ms per NE pair as measured end-to-end. (4) Time Division Multiplexing ingress G.711 (secure calls) to transcoding IP egress with compression codecs (Section 5.9.2.2, Compression) shall not increase delay by more than 250 ms per NE pair as measured end-to-end.	5.9.2.3.9	C
29B	b. Jitter. The addition of an NE shall not cause jitter measured from ingress to egress to increase by more than 5 ms averaged over any 5-minute period.	5.9.2.3.9	C
29C	c. Packet Loss. The addition of an NE shall not cause packet loss measured from ingress to egress to increase by more than 0.05 percent averaged over any 5-minute period.	5.9.2.3.9	C
29D	d. [Required: F-NE, D-NE] For VVoIP systems, if the system decrypts the VVoIP traffic and applies a proprietary encryption approach before transmittal between the two components of the single vendor system, then the system proprietary encryption approach shall be one of the encryption and integrity-approved approaches defined in Section 5.4, Information Assurance Requirements NOTE: For example, if the NE decrypts the AS-SIP with TLS packets between the NEs and re-encrypts it using NE proprietary encryption methods, then the proprietary method must be one of the cryptographic methods defined in Section 5.4, Information Assurance Requirements, (e.g., IPSec with AES-128 bit encryption, HMAC-SHA1 for integrity, and DoD PKI for authentication). All Section 5.4, Information Assurance Requirements, approved encryption and integrity approaches use FIPS PUB 140-2 cryptographic modules (or have been granted a formal waiver by National Institute of Standards and Technology (NIST)). Importantly, proprietary only refers to the lack of interoperability with a different vendor's NE and all cryptographic approaches used in Section 5.4, Information Assurance Requirements, are standards based.	5.9.2.3.9	R
29E	e. [Required: F-NE, D-NE] The VVoIP systems that use proprietary encryption approaches within the system shall restore the VVoIP packets to their original format (e.g., AS-SIP with TLS and SRTP) upon exiting from the system to ensure the VVoIP session can complete successfully.	5.9.2.3.9	R
29F	2. [Conditional] The IP interface shall meet the IP requirements detailed in the DISR and Section 5.3, IP-Based Capabilities and Features, inclusive.	5.9.2.3.9	C
30	The NE devices are to be managed by at least one of the following: A front or back panel and/or external console control capability shall be provided for local management. Remote monitoring and management by the Advanced DSN Integrated Management Support System (ADIMSS) or similar Network Management (NM) systems developed by DoD Components. The following requirements apply: (1) [Required: Data Interface] The NE shall provide network management (NM) data/monitoring via one or more of the following physical interfaces: ** Ethernet/TCP/IP (IEEE 802.3) ** Serial (RS-232)/Asynchronous ** Serial/Synchronous (X.25 and/or BX.25 variant) All data that is collected shall be accessible through these interfaces. For NM purposes, the NE must provide no less than two separate data channels. They may be physically separate (e.g., two distinct physical interface points) or logically separate (e.g., two user sessions through a single Ethernet interface). The data may be sent in ASCII, binary, or hexadecimal data or ASCII text designed for screen/printer display. The data channels shall be used for and, as such, must be capable of providing: ** Alarm/Log Data ** Performance Data (e.g., traffic data) ** NE access (to perform NE data fill administration and network controls)	5.9.2.4.1	R

Table 3-1. NE Capability/Functional Requirements Table (continued)

ID	Requirement	UCR Ref (UCR 2008 CH 2)	F-NE
	(2) [Required: Fault Management] The DSN telephone switching systems shall detect fault (alarm) conditions and generate alarm notifications. The alarm messages must be sent to the assigned NM Alarm channel in near-real time. No alarm restriction/filtering is necessary. In addition to the data formats in Section 5.3.2.17, Management of Network Appliances, alarms may be sent as Simple Network Management Protocol (SNMP) traps. If this channel is also used to output switch administrative log information, the alarm messages must be distinguishable from an administrative log message (3) [Required: Configuration Management] Requirements for this feature shall be in accordance with Telcordia Technologies GR-472-CORE, Section 4.		
31	The NE shall report any failure of self-test diagnostic function on non-active and active channels on a noninterference basis to the assigned NMS.	5.9.2.4.2	C
32	The NE shall provide loopback capability on each of the trunk-side interfaces IAW ITU-T Recommendation V.54.	5.9.2.4.3	C
33	Loss of power should not remove configuration settings. Unit should be restored to the last customer-configured state before the power loss, without intervention when power is restored.	5.9.2.4.4	R
34	The NEs using DLoS transport shall support the following: a. A minimum MOS score as defined in Section 5.9.2.1, General Requirements, performance requirement or better as measured in any 5-minute interval using ITU-T Recommendation P.862 testing standard. b. [Required] The minimum acceptable maximum transmission range (MTR) shall be 300 feet based on operating in an open air-minimal obstruction, clear line-of-sight environment with the DLoS transport device operating at or near full power mode. Based on the testing results, the estimated maximum performance range while still maintaining MOS requirements, as required in item a, shall hereby be referred to as the NE DLoS transport MTR. The MTR baseline-testing environment shall be while operating in an open air-minimal obstruction, clear line-of-sight environment with the DLoS transport device operating at or near full power mode. The NE shall be tested at a minimum operating height of 25 feet with a clear unobstructed line of sight between NEs at a minimum range of 150 feet. The NEs may be tested with attenuation inserted to simulate the actual NE DLoS transport capability from which the maximum MOS performance range MTR can be extrapolated. The value determined shall be included in the APL report. Refer to Section 5.9.2.5.3, Submission of DLoS Transport NEs to UCCO for DSN Connection Request, concerning guidelines on submitting the DLoS transport NE engineering analysis package.	5.9.2.4.5	R
35	The DLoS transport NEs shall be engineered properly so that the DLoS transport transmitting or receiving devices achieve the required performance requirements in their specific deployed environment. The user shall submit a network design and engineering performance analysis with supporting calculations to meet minimum MOS performance with the request for DSN connection. Included is the calculation and data required for determining the MDR, as defined in Section 5.9.2.5.1, DLoS Transport NE Maximum Deployment Range. For certification procedures, the UCCO submittal shall also include wireless security compliancy as identified in Section 5.9.2.6, Security.	5.9.2.5.3	C
36	All components of the NE shall meet security requirements, for each supported mode, as outlined in DoDI 8510.01 and the applicable STIG(s).	5.9.2.6	R
37	1. If a DoD-approved WIDS exists for the DLoS transport technology used, the NE DLoS transport link(s) shall be monitored in according with the appropriate STIG(s).	5.9.2.7	C

Table 3-1. NE Capability/Functional Requirements Table (continued)

LEGEND:

ADIMSS	Advanced DSN Integrated Management Support System
ANSI	American National Standards Institute
APL	Approved Product List
ASLAN	Assured Services LAN
BER	Bit Error Rate
BRI	Basic rate Interface
C	Conditional
CE	Customer Edge
CGA	Carrier Group Alarm
CH	Change
D-NE	Deployed-Network Element
DAA	Designated Approving Authority
DISR	DoD Information technology Standards and Profile Registry
DoD	Department of Defense
DoDI	DoD Instruction
DSN	Defense Switched Network
DVX	Deployed Voice Exchange
E1	European 1 (2048 bps, 30-channel PCM)
E2E	End to End
F-NE	Fixed-Network Element
FIPS	Federal Information Processing Standard
IAW	In Accordance With
ID	Identification
IP	Internet Protocol
ISDN	Integrated Services Data Network
ITU	International Telecommunications Union
ITU-T	ITU Telecommunications Union - Telecommunications Sector
LAN	Local Area Network
MAN	Metropolitan Area Networks
MLPP	Multi-Level Precedence and Preemption
MOS	Mean Opinion Score
Ms	Millisecond
NMS	Network Management System
NSA	National Security Agency
PCM	Pulse Code Modulation
PRI	Primary rate Interface
R	Required
Ref	Reference
SCIP	Secure Communication Interoperability Protocol
SONET	Synchronous Optical Network
STIG	Security Technical implementation Guide
T1	Trunk 1 (1544 bps, 24-channel PCM)
TDM	Time Division Multiplexing
UCCO	Unified Capabilities Certification Office
UCR	Unified Capabilities Requirements
VVoIP	Voice and Video over Internet Protocol

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